

5.6 Sinusoidal Models

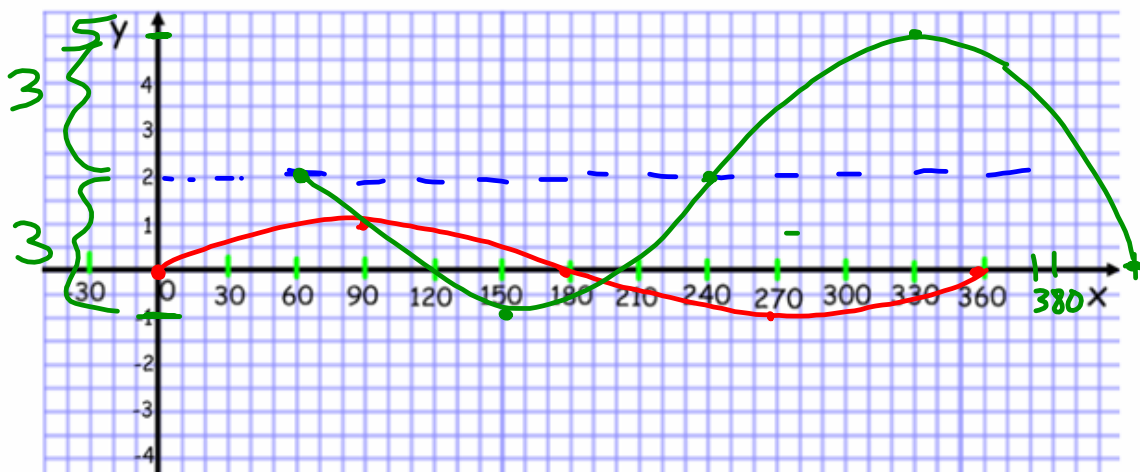
Warm-up:

$$f(x) = \sin x$$

start

1. Sketch a graph of the following functions, for one full cycle

$$f(x) = -3 \sin(x - 60^\circ) + 2$$

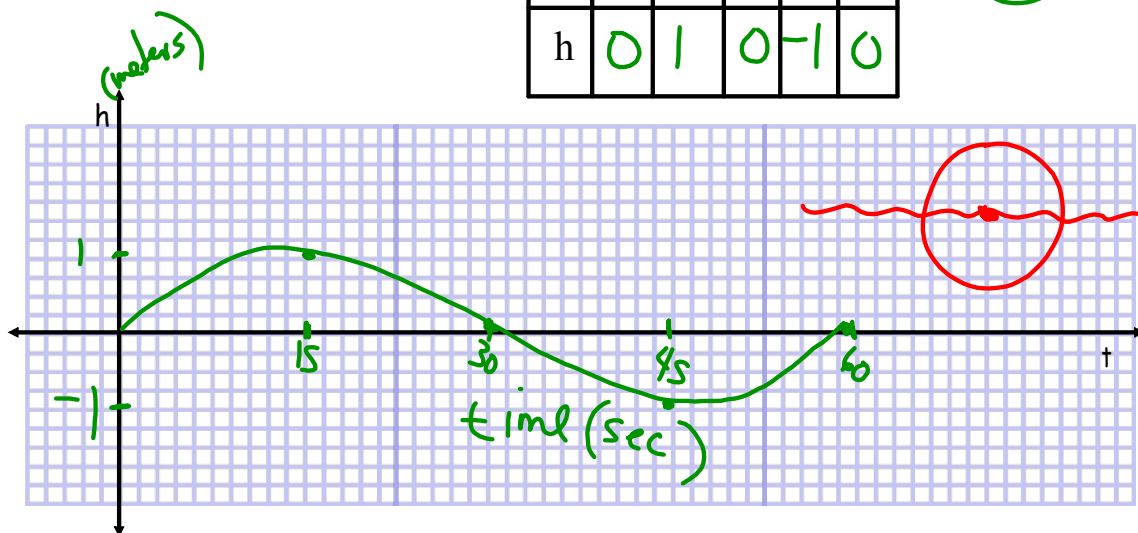


Ex 1 The height of a basket on a water wheel at time  $t$  can be modelled by  $h(t) = \sin(6t)^\circ$ , where  $t$  is in seconds and  $h(t)$  is in meters.

a) The graph the function.

t	0	15	30	45	60
h	0	1	0	-1	0

Period  $\frac{360^\circ}{k}$



b) How long does it take the wheel to make a complete revolution?

Explain how you know 60 secs

The pattern repeats it-self

Could you find this value by looking at the equation?

$y = \sin(6t)^\circ$

Now you have a "k" in your equation

$\frac{6t}{6} = \frac{360^\circ}{6}$   
 $t = 60$

vert stretch/compress    move left/rt    move up/down

$f(x) = a \sin(k(x-d)) + c$

Changes pd (horizontal stretch or compression)    brackets here are important to see the true left/right shift

c) What is the radius of the wheel? Explain how you know.

We know this because the Amplitude is the radius 1 m

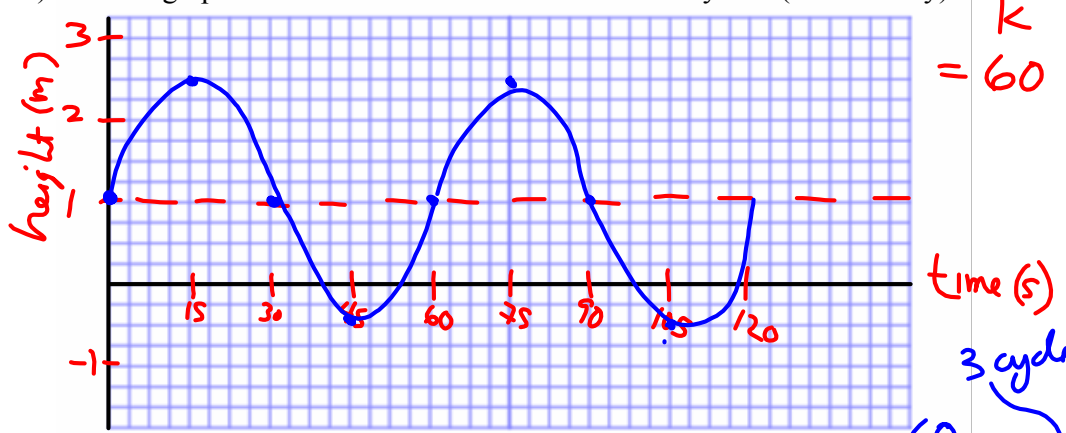
d) Where is the centre of the wheel located relative to the water level?

Explain how you know.

- it is at water level  
 - equation of axis is  $h=0$

2. The height,  $h(t)$  in metres, of a basket on a water wheel above the water at time  $t$ , in seconds, can be modeled by  $h(t) = 1.5 \sin(6t^\circ) + 1$

a) Sketch a graph that models the situation for two full cycles. (label clearly)



b) How long does it take for the wheel to make 1 complete revolution? 60 sec

c) What is the radius of the wheel? 1.5 m

d) How far has the basket traveled in 3 full cycles? 28.3 m

e) Where is the axle of the wheel located relative to water level? 1 m

Distance

$$C = 2\pi r \times 3$$

$$= 28.3$$

## Assigned Work:

p 343 # 11, 12 ; p 349 # 5 ; p 352 # 9, 11-15

p 376 # 19, 20

Be sure to look at questions previously assigned

p 351 # 8, p 375 # 15, 16

## Start Review

p.378 #2, 4, 5

p.379 #6 to 12

p.380 #1 to 6